

Project C

Embedded Controller for the Scripps SeapHOx

Sponsor: SCRIPPS

Mentor: Prof. Todd Martz, SIO (<http://martzlab.ucsd.edu>)

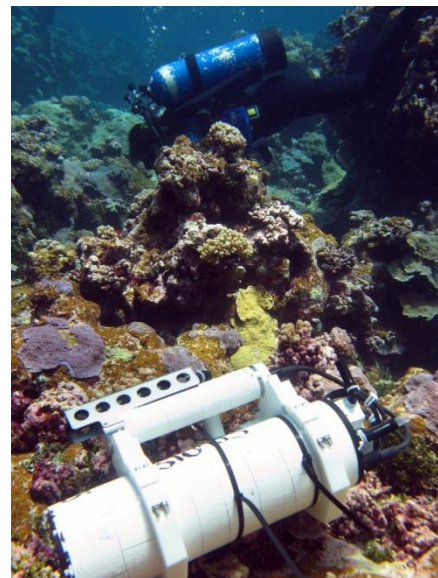
Email: trmartz@ucsd.edu

The Martz Lab at SIO develops autonomous chemical sensors for oceanographic applications¹²³⁴. The “SeapHOx” (pictured below) is an integrated sensor package comprised of commercial sensors for temperature, pressure, salinity, oxygen and pH. The embedded controller used in the SeapHOx must operate for months to years with no human interaction, requiring flawless design in both hardware and firmware. In addition to polling the integrated sensors, the custom microcontroller operates an optically-isolated 24-bit A/D used to record pH, and functions as a state machine that can be polled itself when integrated into large observing systems such as ocean moorings.

We are currently developing a new controller based on ARM Cortex M4 architecture (TI Stellaris <http://www.ti.com/product/lm4f232h5qd>). This is an ongoing project that already has momentum and can be completed by an aggressive team in a 1-qrtr capstone class. Oversight will be provided by two experienced graduate students (one at SIO and one CSE) who have worked with the M4 evaluation board.

Goals of the project include:

1. Using PCB Artist software, incorporate the Cortex M into the present design, replacing the Persistor CF2.
2. Additional components to be added to the PCB layout include an XBee wireless module; MSP430 for monitoring wakeup requests; Ethernet & USB options, and an OLED display.
3. Complete driver libraries for peripheral and external communications (SSI, RS232, USB, etc.)
4. Develop a windows-based UI for non-expert users of the SeapHOx.
5. Perform power draw tests to confirm a power budget.
6. Carry out test deployments in a 6000 L test tank.



- 1 <http://dx.doi.org/10.1371/journal.pone.0028983>
- 2 <http://dx.doi.org/10.1073/pnas.1107789108>
- 3 <http://dx.doi.org/10.4319/lom.2010.8.172>
- 4 <http://dx.doi.org/10.5194/bg-9-3917-2012>